Claims

[c1] In a valve including a metal valve body that defines a flow chamber having a port with annular seat and a metal valve stem having a central axis and rotatable within said body movably mounted in relation to said body for moving soft tip towards and outwardly from said seat, an improvement for sealing an annulus between said body and soft tip, said improvement comprising:

A conical shaped soft tip material having a tip diameter smaller then said seat and a maximum diameter larger then said seat.

Cylindrical mounting means on said metal stem of said soft tip with an inwardly facing annular shoulder and a hole to align said soft tip coaxial to metal stem and said body seat.

Retaining means on said metal stem of said soft tip consisting of a thin tubular section greater than the diameter of said soft tip for effectively retaining the soft tip as it is moved toward and outwardly from said seat during each successive forcing of said soft tip against said body seal as the soft tip is cold formed to the shape of said seal.

[c2] The valve of claim 1 wherein said soft tip retaining means limits the inward movement of the soft tip towards the seal in said body.

[c3] The valve of claim 1 wherein said soft tip retaining means acts as a secondary metal to metal seal.

[c4] The valve of claim 1 wherein the said soft tip retaining means extends beyond said shoulder of said metal stem to be effectively cold formed in the desired conical shape thereby capturing the soft tip.

[c5] The valve of claim 1 wherein said soft tip retaining means limits the radial expansion of said soft tip.

[c6] The valve of claim 1 wherein said soft tip retaining means allows rotation of said soft tip with respect to said metal stem and during high axial force contact with said valve body seat said soft seat tip does not rotate relative to the valve body seat.

[c7] The valve of claim 1 wherein the said soft tip material is made from an

engineered polymer (e.g., Delrin ®).